451-OTP-NCCDS-NCC98

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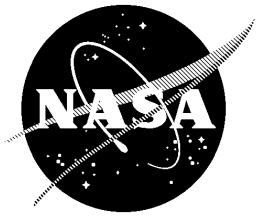
Network Control Center (NCC) Data System (NCCDS) 1998

NCC 98 Operations Transition Plan (OTP)

January 1999



National Aeronautics and Space Administration

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Network Control Center Data System (NCCDS) 1998
NCC 98 Operations Transition Plan (OTP)

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Preface

Network Control Center Data System (NCCDS) 1998 (NCC 98) is the first step in migrating the NCCDS from the current proprietary system to an “open system” featuring a client/server architecture, substantial use of commercial off-the-shelf (COTS) products, and industry standard communications protocols.

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Abstract

This document summarizes the overall activities required to transition from Network Control Center Data System (NCCDS) Release 95.3 to NCC 98. It provides a general description of the activities along with a timeline showing relative durations and ordering relationships. This document provides a basis upon which to coordinate the actual transition.

The transition to NCC 98 requires extensive coordination. It requires the migration of the Service Planning Segment (SPS) database from the current schema on the UNISYS mainframe to a new schema under an Oracle database on a Hewlett-Packard (HP) server. The transition must also facilitate the movement away from proprietary communication protocols to industry-standard protocols. This plan attempts to identify the areas where coordination is necessary.

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Section 1. Introduction

1.1 Purpose

The purpose of this Operations Transition Plan (OTP) is to provide an overall script of activities necessary for the successful delivery of Network Control Center Data System (NCCDS) 1998 (hereafter referred to as NCC 98) to Operations. This plan will assist in the transition of NCC 98 from Operational Evaluation Testing (OET) to Operations.

1.2 Scope

The OTP encompasses the activities required to transition NCC 98 to Operations. This plan discusses:

- Special Considerations
- Transition Activities
  - Establishing the Operational environment in the Operations Control Room (OCR) facility.
  - Removing control from the baseline NCCDS (Release 95.3) and switching to NCC 98.
- Post-transition activities
  - Preparation of the Communications and Control Segment (CCS)1 and CCS2 to support NCC 98.
  - Completion of removal of Intelligent Terminal (IT) Segment (ITS) from the OCR.

The OTP provides an overall approach to moving NCC operations onto the NCC 98 platform. The OTP also includes detailed transition steps, an estimated timeline of activities, and the type of support personnel necessary to transition to NCC 98.

1.3 Document Overview

This document is divided into four sections. This section, Section 1, provides a high-level scope and organization of the document. Section 2 provides special points of consideration, including special instructions that should be addressed prior to the transition of this release to Operations. Section 3 describes the activities required to prepare for and complete the transition of NCC 98

to Operations. Section 4 provides timelines for these activities, indicating relative duration, ordering relationships, and dependencies.

1.4 References

This plan is provided to augment the *Network Control Center (NCC) 98 Test and Transition Master Plan*, Revision A, dated January, 1998. Additionally, the following documents are referenced by this plan or contain related information.

- Network Control Center Data System (NCCDS) System Requirements, 1998, Revision 2 (Draft), April 1998.
- Interface Control Document Between The Network Control Center Data System and The Mission Operations Centers, May 1998.
- Interface Control Document (ICD) between the Network Control Center (NCC)/ Flight Dynamics Facility (FDF) and the White Sands Complex (WSC), Revision 5, June 1997.
- Network Control Center Data System (NCCDS), System Integration Plan, 1998, January 1997.

Section 2. Special Considerations

2.1 General

This section provides information regarding assumptions and impacts that must be addressed in order to transition from NCCDS Release 95.3 (also referred to as the "Baseline NCCDS" or "legacy system") to NCC 98. This information is provided to facilitate the transition process, both at the NCC and at the Space Network (SN) level.

2.2 NCC Considerations

NCC 98 is the first step in migrating the NCCDS from the current proprietary system to an "open system" featuring a client/server architecture, substantial use of commercial off-the-shelf (COTS) products, and industry standard communications protocols. The significant changes required to transition operations onto this new platform will impact NCC Operations and the SN. Assumptions and considerations internal to the NCC related to the transition from Release 95.3 to NCC 98 are identified in this section.

2.2.1 Assumptions

This section identifies conditions internal to the NCC that must exist prior to transitioning to NCC 98. This list includes only those conditions unique to the transition as compared to those for everyday operations.

The assumption for the transition to NCC 98 is:

Database Freeze Is In Effect - The contents of the database must be frozen prior to transitioning to NCC 98. The timeline of activities included in Section 4 of this document provides the relative time to begin the freeze and its duration. This implies that the active schedule consists of events for at least 2 weeks and that the forecast period is free of requests.

2.2.2 Special Instructions

This section identifies specific activities or steps that must be performed during the transition to ensure that the operational environment is stable and normalized for supporting NCC 98. These activities or steps are unique to the transition to NCC 98 as compared to those presented in the high-level timeline of activities presented in Section 4.

The unique considerations for the transition to NCC 98 are:

Population of Ground Terminal Database: The database freeze implies that the ground terminal has been supplied with a sufficient number of vectors and events to provide SN support for 48 hours.

2.3 Network Considerations

2.3.1 Assumptions

This section identifies assumptions that apply to the entire network, including the ground terminals, the NASA Integrated Services Network (NISN), the Sensor Data Processing Facility (SDPF), and all customers of the SN. The assumptions identified are necessary for a successful transition and may be part of normal, everyday operations.

The assumptions for the transition to NCC 98 are:

Legacy Message Switching System (MSS) is Decommissioned - NCC 98 is implemented to support Internet Protocol (IP) communications. This change removes the NCC Front-End (NFE) processors from the NCCDS architecture. Without this equipment, the NCC can no longer support pure 4800BB protocol. Therefore, the legacy MSS must be decommissioned prior to the transition to NCC 98.

This assumption has further implications regarding the user interface channel allocated to scheduled services. NCC 98 will no longer schedule "secondary" user interface channels (UIFCs). Therefore, these UIFCs must be deleted from the configuration codes and all scheduled events in the legacy system prior to performing the NCC 98 database migration.

New Schedule Result Message Content - NCC 98 implemented changes to the format of the Schedule Result Messages (SRMs). These changes were implemented as part of the Flexible Scheduling requirements, which have subsequently been deferred to a future release. However, the changes to the format of the SRM are being retained such that the SRM format was consistent with the format specifications in 530-ICD-NCCDS/MOC. This should not impact customers (i.e., they should be compliant with the approved ICD), it should be verified through Engineering Interface (EIF) testing that the customers can support the new SRM prior to transitioning to NCC 98.

2.3.2 Special Instructions

This section identifies specific activities or steps that must be performed to ensure that the transition to NCC 98 does not negatively impact the activities of the Space Network.

The specific activities for the transition to NCC 98 are:

Proficient Use of Communications Test Messages (CTMs) - With NCC 98, the NCCDS transitions from 4800BB protocol to User Datagram Protocol (UDP)-encapsulated blocks. Because of this change, the NCC will begin sending CTMs to all legacy sites at a configurable interval. These CTMs are necessary to ensure reliable communications when translating between UDP and Transmission Control Protocol (TCP).

Change the TCP Service Hosts - NCC 98 changes the host addresses providing services to TCP/IP customers. With NCC 97, a single server (i.e., the NCC Protocol Gateway (NPG)) provides these services. With NCC 98, these services are provided by multiple hosts, namely the Service Planning Segment (SPS) Replacement (SPSR) and the NPG. TCP MOCs will be impacted during the transition to NCC 98 while network changes are implemented. TCP MOCs should follow the TCP connection establishment instructions as documented in the MOC ICD to reestablish lost service connections.

Update of External Domain Name Server (DNS) - The External DNS, that is the advertisement of services provided by the NCCDS, will be updated at the time of transition. The updated DNS file must be accessed by the Closed IONET DNS server so that TCP MOCs will be able to resolve services to IP addresses. Reducing the "time to live" prior to the transition will force the NISN DNS server to query the External DNS more frequently. This will in turn facilitate the transition from NCC 97 to NCC 98. The update of the Closed IONET DNS is directly related to the previous item. This may include NISN redefining which node is the Authoritative DNS server for the NCC.

Modification of the NISN Secure Gateway Rule Set - The Rule Set defining the activity permitted through the Secure Gateway must be changed as of the NCC 98 transition. The Rule Set must be modified to allow Open IONET entities to communicate with the NCC TCP Service providers as well as access new services, such as Tracking and Data Relay Satellite (TDRS) Unscheduled Time (TUT). This change should be communicated in advance of the transition such that the change in the Rule Sets can be phased in.

Notify Open IONET Customers - Open IONET customers do not use DNS for service to IP Address resolution. Therefore, Open IONET customers (and some Closed IONET customers) must be notified of the new NCC TCP Service providers and a what time they are to become prime. This communication can take place in advance of the transition with a last minute "ready or not" notification of the change of control.

White Sands Complex (WSC) Software Update - NCC 98 requires WSC to send a "new" Schedule Order (SHO) Status message with status code of "5" when events are successfully deleted (or completed) from the WSC database. WSC implemented this software change to be configurable (i.e., either "on" or "off"). "Turning on" this feature requires WSC to change the value of a logical. This activity must be coordinated along with the transition to NCC 98.

Second TDRS Ground Terminal (STGT) Software Update - A software delivery will have to be made to STGT (only) to make the STGT software for the SHO header compatible with the changes made in NCC 98 to support the Dual User SHO and Space Network Interoperability Panel (SNIP) pseudorandom noise (PN) codes. WSC is planning to deliver this fix under ETN-295 to STGT prior to the NCC 98 transition.

Section 3. Transition Activities

3.1 Establish NCC 98 Operational Environment

While NCC operations remain in the operational suite under the current release, the current OET environment will be prepared for NCC 98 Operations. The following sections detail the appropriate preparation for each segment.

3.1.1 SPSR Preparation

The SPSR preparation consists of several activities, including migrating the SPS database, both static and dynamic data areas, establishing SHO records for the existing events, and final verification of the SPS configuration.

3.1.1.1 NCC 98 Baseline Verification

Prior to the day of the transition, the SPSR baseline will be audited and documented. This activity can occur once all changes to the OET baseline have been delivered. This audit will verify that the appropriate versions of executables are resident on the system.

3.1.1.2 Database Migration

The database migration is done in two phases. The first phase will be the migration of the SPS database to flat files. The second phase will be the ingestion of the flat files and additional data into the Oracle database.

By the time of the transition, the OET group will have been testing with a migrated database for several months. Their testing activities have included making the migrated data compatible with NCC 98 Operations for shadowing, EIF testing, etc. The second phase portion of the final database migration will attempt to take advantage of the work performed on the OET database by importing certain tables, such as dbWindowPrivMap, from their database. The potential application of this approach is indicated in the following section.

3.1.1.2.1 Database Migration Assumptions

A list of assumptions has been established to control the database migration from the SPS (legacy NCCDS) to SPSR (NCC 98).

The following assumptions are made for this migration:

- The TDRS Satellite Identification Codes (SICs) and TDRS identifiers (IDs) are as defined in 530-ICD-NCCDS-FDF/WSC (TDRS A/SIC 1300 through TDRS J/SIC 1309. These will be migrated from their definitions in the SPS database.
- UIFC types are derived from their identifiers as follows: "W" channels are local interface (LI) ports; "V" channels are video; "X" channels are analog; "Y" channels are recorder; and "Z" channels are High Data Rate Multiplexer (HDRM) channels. All other UIFCs are assumed to be multiplexer/demultiplexer (MDM) channels.
- The default customer service parameters will be defined in a separate file for ingestion into the SPSR database. This file was originally based on the service parameters for SIC 1294.
- The default TDRS service parameters will be defined in the SPS database as those for SIC 1294.
- The Transmission Rule Sets will be defined by the Database Administrator (DBA) and ingested during the migration (or simply taken from the OET database).
- There will be no migration of vectors, maneuver sets, or delta-Ts.
- There will be limited requests in the forecast period as the desired time for migration is immediately following the weekly schedule activation and transmission. The database migration will NOT migrate forecast requests from the SPS to the SPSR.
- The Scheduler will ensure that the ground terminal has received the maximum number of SHOs possible prior to phase 1 of the migration.
- The Performance Analyst/Acquisition Tracking (PA/ACQ-TRK) operator will ensure that the ground terminal has received the maximum number of vectors as possible prior to phase 1 of the migration.
- After migration, User Schedule Messages (USMs) and Nascom Event Schedule (NES) messages will be generated for all migrated events. This implies that that MOCs, NISN Event Scheduling Terminal (NEST), and SDPF, may receive a schedule message for an event for which they were previously notified. It is assumed that this second message can be "handled" by the respective systems.

3.1.1.2.2 Database Migration Results

The database migration is ultimately supposed to manipulate the existing data such that it can be utilized by NCC 98. This manipulation consists of modifying and deleting existing data, creating new database areas, and efficiently performing data changes that are required for NCCDS 98. Data changes include establishing the initial values for new parameters added with the NCC 98 database. The following list describes the expected results of specific items of the migration.

- The TDRS SICs and IDs are as defined in 530-ICD-NCCDS-FDF/WSC (TDRS A/SIC 1300 through TDRS J/SIC 1309. These will be migrated from their definitions in the SPS database.
- The Space-to-Ground Link Terminal (SGLT) Resources will be defined such that all SGLTs are fully functional. Any adjustment to the availability of SGLT resources will be made by the DBA after migration.
- The TDRS Resources will be defined such that all TDRSs are fully functional. Any adjustment to the availability of TDRS resources will be made by the DBA after migration.
- The list of valid UIFCs for a customer will be the union of all UIFCs included in all configuration codes for that customer resident on the SPS at the time of the migration.
- The UIFCs that require SDPF support will be identified through a list provided by the DBA prior to the migration. The migration will flag all "D" channels and the ones identified by the DBA as requiring SDPF support.
- All combinations of SIC and User ID will have the same password (as migrated from the SPS database). Any definition of new passwords will be done by the DBA after transition (or simply taken from the OET database).
- The list of destinations associated with each SIC will originate from the SPS Schedule Distribution list. All destinations will be defined to be "fixed," vice flexible.
- The Valid IP addresses for each support identifier (SUPIDEN) will be blank. These will be entered by the DBA after transition (or simply taken from the OET database).
- All Multiple Access (MA) Return (MAR) configuration codes will be migrated such that they do not specify an MAR Link.
- The User S-band and K-band PN codes will be migrated to be equal for non-shuttle SICs. The value will be the same as the K-Band PN Code currently stored for each SIC in the SPS database. For Shuttle SICs, the values will be migrated directly from their corresponding values in the SPS database.
- The End Times for MDM and HDRM Overhead records will be set to December 31, 1999, during the migration. The DBA should manually adjust this end time as necessary through the delivered user interface windows.
- The End Times for TDRS-to-SGLT mappings will be set to December 31, 1999, during the migration. The DBA should manually adjust this end time as necessary through the delivered user interface windows.
- SHO IDs for events that have been transmitted to the ground terminal (GT) via the legacy system are mapped to their migrated event. This will be done by executing a transmission

without a service connection to the NPG, overlaying SHO IDs, and then setting the transmission status of each SHO and of the transmission as a whole to completed.

- The maximum forward and return data rates for MDM Channels will be set to 7 Mbps in dbGroundTermPort.

3.1.1.3 Final Verification

After completing database migration activities, a final verification of the complete SPSR environment will be performed. This final verification will be done such that the OET suite will be ready to support Operations immediately following its completion.

3.1.2 CCS Preparation

The CCS preparation will be minimal since CCS3 will be used for the transition. This machine has been undergoing OET testing and should be ready to support NCC 98.

3.1.2.1 NCC 98 Baseline Installation and Verification

Prior to the day of the transition, the CCS baseline will be audited and documented. This activity can occur once all changes to the OET baseline have been delivered. This audit will verify that the appropriate versions of executables are resident on the system.

3.1.2.2 CCS Data File Verification

The Site Table on CCS3 should be compared to the Site Table on CCS1 and CCS2 and updated accordingly. This activity should take place during the preparation for transition.

The Site Table on CCS3 should then be compared to the NPG Configuration files. Differences, if any, between these two files should be resolved at this time.

The DQM_USERS.DAT file on CCS1/CCS2 should be reviewed and compared to CCS3. Any differences between the two files should be resolved such that the file on CCS3 is correct for NCC 98.

3.1.2.3 Final Verification

After completing preparation activities, a final verification of the complete NCC 98 CCS environment will be performed. The final verification will include the execution of a full static data transfer. This final verification will then be done such that the OET suite will be ready to support Operations immediately following its completion.

3.1.3 Workstation Preparation

The workstation preparation will be minimal since these workstations have been undergoing OET testing and should be ready to support NCC 98.

3.1.3.1 NCC 98 Baseline Installation and Verification

Prior to the day of the transition, the baseline on each workstation will be audited and documented. This activity can occur once all changes to the OET baseline have been delivered. This audit will verify that the appropriate versions of executables and other supporting files are resident on the system.

3.1.3.2 Verification of Operator Accounts

Prior to the transition, each operator account should be exercised to ensure the correct configuration. The majority of this activity will be performed in conjunction with operator training provided by OET. For this plan, the list of accounts, groups, and home directories will be compared against each other prior to the migration.

This activity will also verify the assignment of the proper toolbar for each operator. Operators who have been assigned to the DBA, System Supervisor (SS), or Technical Manager (TM) groups will be provided toolbars that grant access to a UNIX terminal window.

3.1.3.3 Final Verification

After completing preparation activities, a final verification of the complete NCC 98 environment will be performed. The final verification will include the execution of “some” options from the toolbar of “some” operator. This final verification will then be done such that the OET suite will be ready to support Operations immediately following its completion.

3.1.4 Firewall Preparation

The Firewall preparation consists of verifying the NCC 98 baseline is installed, verifying the Rule Sets and objects, verifying Mproxy and High-Availability (HA) configuration files, and performing the final checkout.

3.1.4.1 NCC 98 Baseline Installation and Verification

Prior to the day of the transition, the Firewall baseline will be audited and documented. This activity can occur once all changes to the OET baseline have been delivered. This audit will verify that the appropriate versions of executables and scripts are resident on the system.

3.1.4.2 Verification of Rules and Objects

The most important step in preparing the Firewall for operational use is the verification of the Rules and Objects loaded in the active security policy on the Firewall. The Rules should be reviewed to ensure that all rules added to facilitate testing are deleted or disabled.

The Objects should be reviewed to ensure that all objects are correctly identified by name, group, IP address, etc. This activity may require advanced coordination with NISN to ensure that the

correct IP addresses of multicast small conversion devices (SCDs) are in the Firewall objects list.

This audit will also verify that each Firewall has the same rules and objects.

3.1.4.3 Verification of Mproxy Configuration Files

This activity should validate that the NCC Multicast address is correctly entered in the appropriate configuration files. The NCC 98 EIF testing used a multicast address that was different than the operational multicast address. The NCC's multicast address in the Mproxy configuration files should be verified while NCC 97 and NCC 98 run in parallel just prior to the transition.

This activity should also validate that the correct multicast addresses for the MOCs are correctly entered in the appropriate configuration files. The NCC 98 OET testing used a single multicast address for all external interfaces simulated by the NTS. This address must be replaced with the correct operational multicast address for each MOC. These multicast addresses should be verified through EIF testing prior to transition.

This audit will also verify that each Firewall has identical Mproxy configuration files.

3.1.4.4 Verification of HA Configuration Files

The HA configuration files should be audited for correctness prior to the transition. This audit should ensure that

- the correct initial role is defined for each machine.
- the correct heartbeat nodes/addresses are listed.

This audit will also verify that the internal/external (i.e., split) Firewall configuration utilized in testing is normalized. This will establish Closed IONET connections from both Firewalls with the active connection being through the primary firewall.

3.1.4.5 Final Verification

After completing preparation activities, a final verification of the complete NCC 98 environment will be performed. The final verification will include the flow of data from the NPG through the Firewall (Mproxy) to the NCC Test System (NTS). This final verification will then be done such that the OET suite will be ready to support Operations immediately following its completion.

3.1.5 NPG Preparation

The NPG preparation consists of verifying the NCC 98 baseline is installed, verifying the necessary configuration files, and performing the final checkout.

3.1.5.1 NCC 98 Baseline Installation and Verification

Prior to the day of the transition, the NPG baseline will be audited and documented. This activity can occur once all changes to the OET baseline have been delivered. This audit will verify that the appropriate versions of executables and scripts are resident on the system.

3.1.5.2 Verification of NPG Configuration Files

The NPG configuration files should be audited for correctness prior to the transition. This audit should ensure that

- the vehicle IDs (VIDs) on the NPG match those on the SPSR database for each SIC;
- the User ID, SUPIDEN, Password combinations for each Schedule Result Request (SRR) match those in the SPSR database;
- the port numbers in the msscodes file match those in the Mproxy configuration files;
- the correct CCS hostnames and ports are identified (CCS3 initially);
- the use of polynomial error protection (PEP) is enabled for all legacy MOCs;
- the site information in consistent with CCS.

This audit will also verify that each NPG has identical configuration files.

3.1.5.3 Verification of VT Configuration Files

The Vector Translator (VT) configuration files should be audited for correctness prior to the transition. This audit should ensure that

- the correct polling interval is set;
- the correct directory location is specified for the improved inter-range vector (IIRV) files;
- the correct File Transfer Protocol (FTP) server(s) is/are specified;
- the correct server/service for receiving vectors is identified.

This audit will also verify that each NPG has identical VT configuration files.

3.1.5.4 Verification of HA Configuration Files

The HA configuration files should be audited for correctness prior to the transition. This audit should ensure that

- the correct initial role is defined for each machine;
- the correct heartbeat nodes/addresses are listed.

3.1.5.5 Final Verification

After completing preparation activities, a final verification of the complete NCC 98 environment will be performed. The final verification will include the flow of messages from the SCD through the NPG to the CCS, Service Accounting Segment (SAS), and the SPSR. This final verification will then be done such that the OET suite will be ready to support Operations immediately following its completion.

3.1.6 SCD Preparation

The SCD preparation consists of verifying the necessary configuration and performing the final checkout.

3.1.6.1 SCD Configuration Verification

The SCD configuration should be audited for correctness prior to the transition. This audit should ensure that

- the appropriate version of the SCD software is loaded;
- the Nascom Interface Boards (NIBs) of the SCD are configured to route outbound messages over the appropriate RS-422 connection;
- inbound messages are routed to the prime NPG;
- clock rates of each NIB are set correctly.

This audit will also verify that each SCD has the identical configuration.

3.1.6.2 Final Verification

After completing preparation activities, a final verification of the complete NCC 98 environment will be performed. The final verification will include the flow of messages from the NTS through the SCD to the NPG. This final verification will then be done such that the OET suite will be ready to support Operations immediately following its completion.

3.1.7 NSM/Cluster Preparation

The Network and System Management (NSM)/Cluster preparation consists of verifying the NCC 98 baseline is installed, verifying the necessary configuration of COTS products and customized scripts, and performing the final checkout.

3.1.7.1 NCC 98 Baseline Installation and Verification

Prior to the day of the transition, the NSM/Cluster baseline will be audited and documented. This activity can occur once all changes to the OET baseline have been delivered. This audit will verify that the appropriate versions of executables and scripts are resident on the system.

3.1.7.2 Verification of Omniback Schedule and Data Lists

The system backup schedule is stored and acted upon as part of the Omniback product. The audit of the NCC 98 baseline should ensure that the appropriate files are being archived and that this action is being performed at the proper time.

3.1.7.3 Verification of Monitoring Scripts and Package Configuration

Prior to transition, the configuration of the software "packages" should be reviewed and documented. Each package should be "pinged" to verify that it is accessible to the network. The packages should be configured with package switching enabled and running on their primary node.

The "smart scripts" monitoring the processes of each package should also be reviewed to ensure that they are running. The logs created by the smart scripts should be inspected for any occurrences of processes being regularly restarted. Such log entries could indicate a stability issue that should be investigated prior to the transition.

3.1.7.4 Final Verification

After completing preparation activities, a final verification of the complete NCC 98 environment will be performed. The final verification will include the stopping and restarting of each software package to ensure functionality and database consistency. This final verification will then be done such that the OET suite will be ready to support Operations immediately following its completion.

3.1.8 WWW Server Preparation

The World-Wide Web (WWW) Server preparation consists of verifying the NCC 98 baseline is installed, verifying the necessary FTP accounts, verifying the web server, and performing the final checkout.

3.1.8.1 NCC 98 Baseline Installation and Verification

Prior to the day of the transition, the WWW Server baseline will be audited and documented. This activity can occur once all changes to the OET baseline have been delivered. This audit will verify that the appropriate versions of executables and scripts are resident on the system.

3.1.8.2 Verification of FTP Accounts

Prior to the day of the transition, the FTP server configuration will be audited and documented. This audit should ensure that the FTP accounts are created to be identical with the existing FTP accounts in NCC 97. The account for the SPSR to FTP TUT information to the WWW Server is also required.

This part of the audit should also ensure that the setup of the vector translator configuration files on the NPG is consistent with these FTP accounts.

3.1.8.3 Verification of the Web Server Configuration

Prior to the day of the transition, the Web Server configuration will be audited and documented. This audit should ensure that the Web Server configuration is as expected. This audit will also ensure that the TUT distribution scripts are configured correctly and that TUT information will be available to IONET MOCs as of the successful transition to NCC 98.

This audit will also ensure that the "internal" Web Server configuration is as expected. This will verify that TUT information and on-line documentation are available to the NCC operators.

3.1.8.4 Final Verification

After completing preparation activities, a final verification of the complete NCC 98 environment will be performed. The final verification will include transfer of TUT data from the SPSR to the WWW Server. This final verification will then be done such that the OET suite will be ready to support Operations immediately following its completion.

3.1.9 NCD Preparation

The NCC Central Delogger (NCD) preparation consists of verifying the NCC 98 baseline is installed, verifying the necessary environmental variables, and performing the final checkout.

3.1.9.1 NCC 98 Baseline Installation and Verification

Prior to the day of the transition, the NCD baseline will be audited and documented. This activity can occur once all changes to the OET baseline have been delivered. This audit will verify that the appropriate versions of executables and scripts are resident on the system.

3.1.9.2 Verification of Environment Variables

Prior to the day of the transition, the system configuration will be audited and documented. Part of this audit should ensure that the NCD environment variables have been properly defined. This audit should also include verification that the necessary Network File System (NFS) mount points have been created and are accessible by the NCD software.

3.1.9.3 Final Verification

After completing preparation activities, a final verification of the complete NCC 98 environment will be performed. The final verification will include the execution of a delog to ensure that each set of log files is accessible. This final verification will then be done such that the OET suite will be ready to support Operations immediately following its completion.

3.1.10 SRIS Preparation

3.1.10.1 NCC 98 SRIS Baseline Verification

Prior to the day of the transition, the System Resource Infrastructure Segment (SRIS) baseline will be audited and documented. This activity can occur once all changes to the OET baseline have been delivered. This audit will verify that the appropriate versions of executables and scripts are resident on the system.

3.1.10.2 Verification of Internal DNS Entries

Prior to the day of the transition, the internal DNS files will be audited and documented. This audit should ensure that

- each node of the operational network is correctly identified in both forward and reverse look-up tables;
- each virtual address and corresponding node name are correctly mapped together;
- NCC services are defined with their corresponding virtual address;
- the necessary aliases for the ground terminals and NISN/SDPF are properly defined.

This audit should also ensure that each node is configured to reference the primary and secondary DNS tables on the 3-node cluster.

3.1.10.3 Verification of External DNS Entries

Prior to the day of the transition, the external DNS files will be audited and documented. This audit should ensure that

- each virtual address and corresponding node name are correctly mapped together;
- NCC services are defined with their corresponding virtual address.

This audit should also ensure that the expiration time is set to ensure that changes to the table are acquired by the MOCs in a timely fashion.

3.1.10.4 Verification of NTP Configuration

Prior to the day of the transition, the Network Time Protocol (NTP) Configuration will be audited and documented. This audit should ensure that

- the CCS Universal Time Code (UTC) process is running on CCS3;
- the nodes of the 3-node cluster are configured to query the VAX as their time server;
- the nodes of the 3-node cluster broadcast the time to the other nodes of the network;

- the WWW Server queries the Firewall as its time server.

3.1.10.5 Verification of NFS Mount Points

Immediately prior to the transition to NCC 98, System Administration personnel will verify that each relevant mount point is established. The lack of such mount points could also be determined in other verification steps that rely on mounted files.

3.1.10.6 Final Verification

After completing preparation activities, a final verification of the complete NCC 98 environment will be performed. The final verification will include activities that will adequately determine if the DNS tables and mount points are correct. This final verification will then be done such that the OET suite will be ready to support Operations immediately following its completion.

3.1.11 SAS Preparation

The SAS preparation consists of installing, configuring, and verifying the SAS software (and network configuration) to support the NCC 98 architecture. The software consists of components on both the SAS server and SPSR server platforms. Preparations for each platform is described below.

3.1.11.1 SAS Server Preparation

3.1.11.1.1 NCC 98 Baseline Installation and Verification

At least one week prior to the transition, the SAS R99.1 release should be installed and made operational on the SAS1 computer. The release should be operated in the "NCC 97 mode" until the time of the transition. Refer to the *SAS Release 99.1 Software Release Notes* for more details concerning the installation and operation of this software.

3.1.11.1.2 Verification of Configuration

The "NCC 97 mode" functioning of the release will be verified as part of the initial installation process. Prior to the day of the transition, additional, "NCC 98 mode" verifications will be performed. These additional verifications will ensure NCC 98 network connectivity and "NCC 98 mode" functions.

- Verify RTnet-TCP/32 network configuration (particularly IP addresses of the SAS1 server, STGT, and White Sands Ground Terminal (WSGT))
- Verify Knet network configuration.
- Verify network connectivity by pinging both SAS network implementations from an SPSR server.

- Verify Open Database Connectivity (ODBC) server functions by using oaisql from an SPSR server to query the SAS database.

3.1.11.1.3 Final Verification

After completing preparation activities, a final verification of the complete NCC 98 environment will be performed. Verify that any schedule additions or deletions made in SPSR (e.g., readiness Bilateral Ranging and Tracking System (BRTS) events) are replicated in the SAS database. Use the SAS DAC status command to verify connections to the ground terminal services and that operations data messages (ODMs), operations messages (OPMs), and Service Level Reports (SLRs) are being received. Use existing stored queries to verify that the SAS database is being updated properly with information from the ODMs, OPMs, and SLRs. This final verification will be done such that the OET suite will be ready to support Operations immediately following its completion.

3.1.11.2 SAS Specific SPSR Server Preparation

3.1.11.2.1 NCC 98 Baseline Installation and Verification

Prior to the day of the transition, the SAS component of the SPSR server baseline will be audited and documented. This activity can occur once all changes to the OET baseline have been delivered. This audit will verify that the appropriate versions of executables and scripts are resident on the system.

3.1.11.2.2 Configuration Verification

Prior to the day of the transition, the SAS configuration will be audited and documented. This audit will ensure that the ODBC Driver is properly configured to support the operational environment and that the Schedule Replication Agent (SRA) application has the proper configuration.

- Verify the contents of openrda.ini file (particularly logging levels).
- Use rdaadmin to verify the existence of the operational SAS databases and the IP addresses of the operational SAS servers in the Database Resource Directory (DRD).
- Verify the contents of the sashpux.cfg file (particularly the database URLs).
- ping the operational SAS ODBC server to verify network connectivity.
- Use oaisql to verify the functioning of the operational SAS ODBC server.

3.1.11.2.3Final Verification

After completing preparation activities, a final verification of the complete NCC 98 environment will be performed. Use MC/ServiceGuard displays and syslog entries to verify that SRA started successfully. Verify that any schedule additions or deletions made in SPSR are replicated in the SAS database. This final verification will be done such that the OET suite will be ready to support Operations immediately following its completion.

3.2 Transition to NCC 98

Once the final verification of the NCC 98 system has been completed, the actual transition of Operations will begin. The basic approach for the transition is provided below. These items are detailed in the Transition Timeline contained in Section 4.

- establish NCC 98 connection to Closed IONET. This results in NCC 97 and NCC 98 coexisting on the network.
- startup Firewall and Mproxy applications. Messages from non-TCP MOCs should now be seen in both the baseline NCCDS and NCC 98.
- startup packages on 3-node cluster.
- startup CCS3 applications. Verify exchange of static data and events.
- Verify updates to external DNS and push them to NISN DNS server. Notify Open (and Closed) IONET customers to use NCC 98 service IP addresses as of time X.
- Transfer control from the legacy system to NCC 98:
  - Terminate CCS applications on CCS1 and CCS2;
  - Terminate Restricted Access Processor (RAP) applications on RAP1 and RAP2
  - Terminate NCC 97 NPG applications;
  - Move RS-422 lines from operational NFE to NCC 98 SCD for STGT, WSGT, and Special Projects and Missions (SP&M);
  - Startup NPG application.

With the start of the NPG application software, NCC 98 should begin processing messages and control of the NCCDS has been switched to NCC 98. TCP MOCs should now begin using the NCC 98 services, which were advertised in the DNS update.

3.3 Contingency Plans

Once the NCC has transitioned to the NCC 98 system, there will be a small window of time to return to the Baseline NCCDS in the event that NCC 98 fails to support operations as necessary.

In order to return to the legacy system, the following steps should be followed:

- Update the external DNS to be accessible to NISN DNS server. Notify Open IONET customers to return to use NCC 97 IP service addresses as of time Y.
- Transfer control from the NCC 98 system to the legacy system
  - Terminate NCC 98 Firewall applications;
  - Terminate NPG 98 application;
  - SAS1 must be configured to NCC 97/98 mode during the fallback and to NCC 97 mode when the fallback is complete;
  - Startup SPS applications on SPS1 or SPS2. The message ID counter should be set to a value greater than the highest SHO ID generated by SPSR during NCC 98 operations;
  - Move RS-422 lines from NCC 98 SCD for STGT, WSGT, SP&M to the desired NFE;
  - Startup RAP applications on RAP1 and RAP2;
  - The NCC 98 disks on CCS1 and CCS2 should be powered off and the 95.3 disks powered up. The VAXs should then be rebooted under the NCCDS 95.3 environment; startup CCS applications on CCS1 and CCS2.
- Review any schedule updates enacted on the NCC 98 system and update the legacy system as needed (e.g., resubmit schedule add requests (SARs), FDF retransmit vectors, transmit SHOs). Scheduling algorithms between the two systems are different, so the resulting events on the legacy system may be different then those on the NCC 98 system.

Obviously, as the effort of this last step increases, the feasibility of falling back to the legacy system decreases. Therefore, the longer the database freeze can be maintained, the larger the window of opportunity for falling back to the legacy system. At some point, the decision to "fix NCC 98" instead of returning to the legacy system must be made. This decision will be made by the Space Network Project Manager based on input from development, test, system administration, and operations personnel.

The rigorous testing that was performed on NCC 98 reduces the likelihood that this contingency plan will be utilized. This minimal risk also resulted in the decision to not pursue a "reverse database migration" tool. This decision, along with the associated analysis, titled *Fallback from NCC 98 to NCC 97: Options and Recommendation,* is captured under NCC 98 Issue #75.

3.4 Preparation and Failover to CCS1 and CCS2

After Operations has gained a minimal level of confidence in NCC 98 while operational on CCS3, the preparation of CCS1 and CCS2 will be completed. This preparation consists of all steps necessary to establish and verify the complete NCC 98 baseline for the CCS-VAX.

3.4.1 CCS1 and CCS2 Preparation

The complete preparation of the operational suite must include the reconfiguration of CCS1 and CCS2. In order to preserve the ability for Operations to fallback to NCCDS Release 95.3 on CCS1 and CCS2, the disk shadow set will be split approximately one week prior to the transition. The necessary COTS products and the NCC 98 baseline will then be installed on the unused disks.

After Operations has gained a minimal level of confidence in NCC 98 while operational on CCS3, preparation of CCS1 and CCS2 will be completed. This includes the installation of Multinet, ObjectBroker, and modified applications code will be completed. The preparation of CCS1 and CCS2 will also include deletion of obsolete baselines, including the Release 95.3 delogger and log files. Therefore, log files should be backed up to tape prior to the release of CCS1 and CCS2 by Operations. Therefore, these log files should be backed up to tape prior to the release of CCS1 and CCS2 by Operations. Before being used operationally, each CCS should be cold started to ensure that the correct applications start, log files are created, and operator accounts are setup for NCC 98.

3.4.2 Failover to CCS1 and CCS2

After the preparation of CCS1 and CCS2 is complete, Operations will identify a window of opportunity to failover from CCS3 to CCS1 and CCS2 . In order to complete this failover, the NPG configuration files must be modified (or reloaded) to communicate with the new node names and addresses. This change requires an NPG restart (or switchover). The System Context files for the ccs_services package on the HPs (cluster and workstations) will also have to be redefined for the new nodes. This requires a restart of the ccs_services package.

Once the point of no return to NCCDS 95.3 has been reached, the disks on CCS1 and CCS2 can be restored to the shadow set. This action should be done gradually so as to minimize any performance impact that could result. The completion of CCS1 and CCS2 will also include deletion of obsolete baselines, including the Release 95.3 delogger and log files. Therefore, these log files should be backed up to tape prior to the release of CCS1 and CCS2 by Operations.

3.5 ANCC Preparation

The preparation of the Auxiliary NCC (ANCC) is not required for the transition of Operations to NCC 98.

3.6 OCR Completion

3.6.1 IT Removal

The removal of the OCR ITs will occur once the transition to NCC 98 is determined to be successful.

3.6.2 Workstation Installation

Once the removal of the ITs is complete, the installation of the remaining OCR Workstations will be completed. This activity includes the installation, integration, and verification of new workstations as well as the repositioning of the original OCR Workstations. This activity will be performed on an aggressive, but non-impacting basis.

Each new workstation will be configured, connected to the network, and exercised prior to its turnover to Operations.

Section 4. Transition Timelines

4.1 Timeline of Activities for the Initial NCC 98 Operational Transition

The following timeline (Figure 4-1) shows start time, duration, and the responsible group for each activity required to configure the NCC 98 environment in the OCR. This timeline also attempts to illustrate any dependencies between the activities. The timeline also assumes certain associations between these activities and the OET effort. These assumptions are suggested as "a plan" and should not be interpreted as dictating these actions.

Table 4-1. Initial Transition Timeline

Start Time	Activity	Personnel	Dependencies/Comments
T-2 weeks	Ensure that necessary updates to the NISN Secure Gateway have been requested.	OET GSA D.4	
T-1 week	Secondary UIFCs are removed from config code and events.	DBM	IONET is IP-only
	Ensure STGT software delivery ETN-295 has been installed	NCCPO	Assumed to be on or about February 3rd
	Make image saves of CCS3, include Multinet and ObjectBroker save sets and 98_1 baseline.	GSA D.4	
	Identify differences in CCS command procedures, especially startup scripts.	GSA D.4	
T-1 week	Review groups, accounts, & home directories	GSA D.4 OET	
	Compare CCS Site Table, NPG Config files, and Mproxy config file	OET DBM	Turn poly "on" Turn CTMs off for MPC, BRM, SDPF, Remove schStatus service for BRM Verify Multicast addresses Establish CCS3 and CCS1/CCS 2 copies.
	Audit SPSR Baseline	GSA D.4	

Start Time	Activity	Personnel	Dependencies/Comments
	Audit CCS Baseline	GSA D.4	Verify existence of correct ObjectBroker .col files.
	Audit NPG Baseline	GSA D.4	
	Audit NCD Baseline	GSA D.4	
	Audit Workstation Baseline	GSA D.4	Verify existence of correct ObjectBroker .col files.
	Audit Firewall Baseline	GSA D.4	Ensure correct security policy is activated.
	Audit SPSR Baseline	GSA D.4	
T-1 week	Audit SAS component of SPSR	SAS Dev	
	Install SAS 99.1 on SAS1	SAS Dev	
	Split shadow disks on CCS1 and CCS2. Begin population of disks from tape.	GSA D.4	
T-1 day	Ensure "split Firewall" configuration is broken and both Firewalls are connected to Closed IONET.	GSA D.4	
	Ensure that ANCC Firewall has correct Rule Set activated	OET	
	Initialize ITO and Omniback databases	GSA D.4	
	Delete all log files created during OET activities	GSA D.4	
	Delete all old TUT files generated during OET	GSA D.4	
T-10 hours	Activate Schedule	OPS	None
	Dynamic Dump on SPS (Database Freeze now in effect)	OPS	
	Load Dump onto SPS3	OPS	
T-9 hours	Perform phase 1 of migration	GSA D.4	st ncc*ncc.telnet-start,,,ncc/ncc @add ncc*ncc.spsdatadwnld
	Activate 3-node cluster; start nfshost, sn-oracle, itohost and omniback packages	GSA D.4	~dbmig/ops_migration/preLoad
	Perform phase 2 of migration	GSA D.4	~dbmig/ops_migration/postLoad make –f Makefile_ops all make –f Makefile_ops load

Start Time	Activity	Personnel	Dependencies/Comments
T-5 hours	start spsrhost, ccshost, rosehost, acrshost, sas	GSA D.4	
	Perform manual database updates	GSA D.4 NCC DBA	SUPIDEN/IP address entries Destination names for future TCP entities Activate transmission rule sets and purge jobs Update passwords for VR, SRR messages Establish relative boundary schedule and interval. Establish Absolute and Current Boundary times. Remove BRM from all schedule distribution lists and Rule sets.
	Create database reports for inspection	GSA D.4 NCC DBA	
	Perform SHO creation; ID migration	GSA D.4	
T-2 hours	Cold start CCS; verify data transfer	OPS GSA D.4	
	Logon to workstation; verify functionality; begin database checkout.	OET GSA D.4	
	Initiate Hot Backup of SPSR Database	GSA D.4	
	Readdress TUT MAC and move to NCC 98 network.	OPS GSA D.4	
	Execute scenario to perform final verification.	OET GSA D.4	
FINAL VERIFICATION IS COMPLETE			
T-1 hours	Establish Connection to Closed IONET		
	Startup Firewall and Mproxy applications. Verify Firewall Rule set is configured correctly and activated.		Verify NCC Multicast Address
	Configure SAS1 to “NCC97/98” Mode	SAS DBA	

Start Time	Activity	Personnel	Dependencies/Comments
	Verify updates to external DNS and availability to NISN Inform TCP Customers to switch to NCC 98 IP Addresses		Affects LS7 Affects HST, EOS, DAS
T- 15 minutes	Terminate CCS1 and CCS2 and NCC 97 NPG		NCC is now off-line!
	Move RS-422 connections from NFE to NCC 98 SCD		
T+0 hours	Start NPG for NCC 98		NCC is back on-line under NCC 98!
	Verify SAS has connections to NPG and is receiving ODMs, OPMs, SLRs	SAS Dev/ SAS DBA	
T+ 0.5 hours	Schedule and transmit BRTS events to verify NCC 98 readiness for schedule updates.		
	Verify that the SAS database receives BRTS event.	SAS DBA	
T+1 hour	Receive full vector transmission from FDF.		
	Transmit type 8 to ensure throughput rule set activated ????		
	Remove database freeze for real-time schedule updates		
T+3 hours	Notify MOCs one-by-one to send in forecast requests for next schedule generation.		
T+6 hours	Configure SAS1 to “NCC98 Mode”	SAS DBA	
T+n hours	Inform NISN to redefine the Authoritative DNS server for the NCC.		

4.2 Timeline of Activities to Configure CCS1 and CCS2

The following timeline (Figure 4-2) shows start time, duration, and responsible group for each activity required to configure CCS1 and CCS2 into the operational suite of equipment. This timeline also attempts to illustrate any dependencies between the activities.

Figure 4-2. CCS1 and CCS2 Transition Timeline

Start Time	Duration	Activity	Personnel	Dependencies
T-7 days		Perform NCC 98 image save on CCS3	OPS GSA D.4	None
T-4 days		Split shadow sets; populate NCC 98 disks from CCS3 image save	OPS GSA D.4	
T+0		NCC 98 is accepted by Operations on CCS3	OPS	None
T+2 hours		Power 95.3 set of disks off.	OPS	None
T+3 hours		Configure redundant disks to be NCC 98 compliant (as described below)	GSA D.4	Completion of previous step
		➢ Upgrade Multinet ➢ Install ObjectBroker ➢ Create/Update DNS on VAX ➢ Modify IP Addresses ➢ Complete installation of NCC 98 Custom Application software ➢ Patch CCS1 LAN 1 to Devlan1 in the NACC ➢ Patch CCS 2 LAN 1 to Devlan2 in the NACC ➢ Configure V-LAN once nodes appear on Switch Manager	GSA D.4 OPS	None
T+6 hours		Install CM Baseline software onto CCS1 and CCS2	OPS	None
T+9 hours		Perform final checkout of CCS1/2	GSA D.4 OET	None
T+10 hours		Make a full image save of NCC 98		
T+11 hours		Power up remaining disks and return them to the Shadow Set	OPS	Installation of software
T+n hours		Move Operations to the CCS1/CCS2	OPS	Completion of Checkout

Abbreviations and Acronyms

ABR	Abbreviations
ACQ/TRK	Acquisition and Tracking
ANCC	Auxiliary Network Control Center
ATSC	AlliedSignal Technical Services Corporation
BRTS	Bilateral Ranging and Tracking System
CCS	Communications and Control Segment
CM	configuration management
COTS	commercial off-the-shelf
CSC	Computer Sciences Corporation
CTM	communications test message
DAS	demand access service
DBA	database administrator
DNS	domain name server
DRD	Database Resource Directory
EIF	engineering interface test
EOS	earth observing satellite
FDF	flight dynamics facility
FTP	file transfer protocol
GSA	general service agreement
GSFC	Goddard Space Flight Center
GT	ground terminal
HA	high availability
HDRM	high data rate multiplexer
HP	Hewlett-Packard
HST	Hubble Space Telescope

ICD	interface control document
ID	identification; identifier
IIRV	improved interrange vector
IP	internet protocol
IT	intelligent terminal
ITS	intelligent terminal segment
LAN	local area network
LI	local interface
LS7	Landsat 7
MAR	multiple access return
Mbps	mega-bits per second
MDM	multiplexer/demultiplexer
MOC	mission operations center
MSS	message switching system
NACC	network access control card
NASA	National Aeronautics and Space Administration
Nascom	NASA communications
NCC	Network Control Center
NCCDS	Network Control Center Data System
NCCPO	NCC Project Office
NCD	NCC Central Delogger
NES	Nascom Event Schedule message
NEST	NISN Event Scheduling Terminal
NFE	NCC front-end
NFS	network file server
NIB	Nascom interface board
NISN	NASA Integrated Services Network
NPG	NCC Protocol Gateway

NTP	network time server
NTS	NCC Test System
OCR	Operations Control Room
ODBC	Open Database Connectivity
ODM	operations data message
OET	Operational Evaluation Testing
OPM	operations message
OPS	Operations
OTP	Operations Transition Plan
PA	performance analyst
PEP	polynomial error protection
PN	pseudorandom noise
RAP	restricted access processor
SAR	schedule add request
SAS	service accounting segment
SCD	small conversion device
SDPF	sensor data processing facility
SHO	scheduled service order
SIC	satellite identification code
SGLT	space to ground-link terminal
SLR	service-level request
SN	space network
SNIP	Space Network Interoperability Panel
SP&M	special projects and missions
SPS	service planning segment
SPSR	service planning segment replacement
SRA	Schedule Replication Agent
SRIS	system resources infrastructure segment

SRM	schedule result message
SRR	schedule result request message
SS	system supervisor
STGT	Second TDRSS Ground Terminal
SUPIDEN	spacecraft identification
TCP	transmission control protocol
TDRS	Tracking and Data Relay Satellite
TM	technical manager
TUT	TDRSS unscheduled time
UDP	user datagram protocol
UIFC	user interface channel
USM	user schedule message
UTC	universal time code
VAX	virtual address extension
VID	vehicle identification
V-LAN	virtual LAN
VR	vector request message
VT	vector translator
WSC	White Sands Complex
WSGT	White Sands Ground Terminal
WWW	World-Wide Web